TRAJECTORY- AND SATELLITE-BASED FLIGHT PLANNING PRODUCTS FOR INTEX-A

GSFC/ARC/UMD Project Website: http://croc.gsfc.nasa.gov/intex

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Summary of Proposed Work
We propose to provide trajectory- and satellite-based products for flight planning support for the INTEX-A campaign in Summer 2004. We will generate unique forecast products on a daily basis that will contribute to planning DC-8 flights for INTEX-A. These analyses are similar to those we have provided for a number of previous campaigns, such as SONEX, ACCENT, PEM Tropics-B, and TRACE-P. We will produce convective influence maps, which provide a measure of the areal distribution of air influenced by convection at a variety of altitudes. This product will be based on a combination of geostationary satellite IR images and upper tropospheric trajectories. We will produce a lightning influence forecast product that utilizes a similar set of trajectories along with the observed lightning flash data from the National Lightning Detection Network. We will also collaborate on a joint lightning/convective influence product. An aerosol exposure forecast product will be generated from the TOMS Aerosol Index data using lower to middle tropospheric trajectories. Stratospheric influence will be depicted using a potential vorticity (PV) reverse domain-fill forecast. This project is coordinated with a project (A. M. Thompson, PI) to provide quick turn-around ozone profile data from a network of soundings in the INTEX region. Trajectories from polluted layers within soundings will also support flight planning. We will provide field support for interpretation of our scientific products and for overall flight planning.

Model Description
Algorithms for each product differ, but all include use of assimilated and forecast meteorological data from the GEOS-4 Data Assimilation System (GEOS-4 DAS) run by the NASA Goddard Global Modeling and Assimilation Office (GMAO). Acquisition of these data requires interaction with GMAO personnel. The GEOS-4 DAS data are used

in the Goddard Trajectory Model, which is an integral part of the algorithm used in generating each product. Some of the products also require ingestion of satellite data, such as GEOS IR images and TOMS Aerosol Index data.

Product List

GMAO GEOS-4 Meteorological Fields
- Constant pressure maps (925, 850, 700, 500, 300, 250 hPa)
  - displaying winds, geopotential height contours, temperatures
- Constant potential temperature maps (325, 330, 335, 340, 345, 350, 355, 360 K)
  - displaying winds, Ertel's potential vorticity, Montgomery stream function
- Tropopause height
- Relative humidity (925, 850, 700, 500, 300, 250 hPa)
- Convective cloud mass flux (925, 850, 700, 500, 300, 250 hPa)
- Convective cloud detrainment (925, 850, 700, 500, 300, 250 hPa)
- Five-day back trajectories (kinematic at 850, 700, 500, 300 hPa, isentropic at 325, 340 K)

Trajectory Model Exposure Products
- Convective influence maps for 3 or 4 isentropic surfaces
- Exposure to lightning flashes – kinematic 500, 300 hPa; isentropic 325, 340 K
- Reverse Domain Fill (RDF) for Potential Vorticity – isentropic 325, 340 K
- Exposure to Dust/Smoke – kinematic 850, 700, 500 hPa
- Aircraft emission exposure – kinematic 700, 500, 300 hPa; isentropic 325, 340 K

Satellite Products
- Regional TOMS Aerosol Index
- Global TOMS Aerosol Index

National Lightning Detection Network Gridded Flash Counts